PERCENTAGE SOLUTIONS AND ALLIGATION.*

BY H. L. THOMPSON.

There is no one subject which receives such a great amount of discussion as the prescriptions calling for such and such a percent of this or that, and how to go about filling them when one has certain materials on hand.

It would be a very simple matter, if the specifications after percent, %, were written w/w, w/v, or v/v as the case may be. There seems to be little understanding upon these matters, between the physicians who prescribe, and the pharmacists who fill and dispense such prescriptions.

% w/w, percent weight to weight, percent absolute, is a percentage based entirely on the weight of the finished product.

% w/v, percent weight to volume or percentage concentration, is a percentage by weight based on the volume of the finished product.

% v/v, percent volume to volume, is based as a percent by volume on the volume of the finished product.

In all three cases, the percentage solutions are approximately alike for weak percentage solutions, and if water solutions, but not exactly so. This discrepancy is still more pronounced in stronger percentage solutions, especially saturated solutions, and when solvents other than water are used.

For example, consider in the metric system the following problem of a 5% solution of KI, potassium iodide, in water, syrup and alcohol, 5% w/w, 5% w/v, and their possibilities. And for a liquid 5% v/v.

PERCENT, ABSOLUTE.—PERCENT, BY WEIGHT. W/W.

This method is the most accurate, and in the use of the metric system is very simple. It represents Gm. of substance in 100 Gm. of finished product, or parts per 100.

A 5% w/w solution would contain 5 Gm. of substance in 100 Gm. of solution. A 10% solution would contain 10 Gm. in 100 Gm.

There are four ways of making these, two making up to 100, and two having 100 Gm. of solvent.

Thus consider a 5% solution of KI.

To make it take	5 Gm. of KI	or take	5 Gm. of KI
add	95 Gm. of water	add	95 mils of water
total	100 Gm. of solution	total	100 Gm. of solution

If the specific gravity of the solvent is heavier than water, as syrup, sp. gr. 1.313,

take	5 Gm. of KI	or take	5 Gm. of KI
add	95 Gm. of syrup	add	—72.35 mils of syrup
total	100 Gm. of solution	total	100 Gm. of solution

95 Gm. ÷ 1.313 = 72.35 mils of syrup.

If the specific gravity is lighter than water, as alcohol, sp. gr. 0.816,

take	5 Gm. of KI	or take	5 Gm. of KI
add	95 Gm. of alcohol	add	116.4 mils of alcohol
total	100 Gm. of solution	total	100 Gm. of solution

95 Gm. ÷ 0.816 = 116.4 mils of alcohol.

In all these cases the volumes are not 100 mils but vary inversely as the specific gravity of the solvent. With the water solution it is practically about 100 mils, with the syrup about 75 mils, and with the alcohol about 120 mils.

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If one takes 100 mils or 100 Gm. of water and desires to make a 5% sol. by addition of KI, proceed as follows:

$$
\begin{aligned}
100\% - 5\% = 95\% &= 100 \text{ Gm. of water} \\
1\% &= 1.053 + 95 = 1.053 \\
100\% &= 105.3 \text{ Gm. of solution} \\
5\% &= 105.3 - 100 = 5.3 \text{ Gm. of KI}
\end{aligned}
$$

Therefore add 5.3 Gm. of KI to 100 Gm. of water to make a 5% solution.

If syrup, to 100 Gm. add 5.3 Gm. of KI,
or use $100 \div 0.313 = 76.15$ mils of syrup, and add 5.3 Gm. of KI,

If alcohol, to 100 Gm. add 5.3 Gm. of KI,
or use $100 \div 0.816 = 122.6$ mils of alcohol and add 5.3 Gm. of KI.

In case 100 mils of syrup are used and a 5% w/w solution is desired, $100 \times 1.313 = 131.3$ Gm. of syrup.

$$
\begin{aligned}
100\% - 5\% = 95\% &= 131.3 \text{ Gm. of syrup} \\
1\% &= 131.3 \div 95 = 1.382 \\
100\% &= 138.2 \text{ Gm. of soln.} \\
5\% &= 138.2 - 131.3 = 6.9 \text{ Gm. of KI to be added.}
\end{aligned}
$$

Therefore add 6.9 Gm. KI to 100 mils of syrup to make it 5% w/w.

In case 100 mils of alcohol are used and a 5% w/w solution is desired, $100 \times 0.816 = 81.6$ Gm. of alcohol.

$$
\begin{aligned}
100\% - 5\% = 95\% &= 81.6 \text{ Gm. of alcohol} \\
1\% &= 81.6 \div 95 = 0.859 \\
100\% &= 85.9 \text{ Gm. of sonl.} \\
5\% &= 85.9 - 81.6 = 4.3 \text{ Gm. of KI to be added.}
\end{aligned}
$$

Therefore add 4.3 Gm. of KI to 100 mils of alcohol to make it 5% w/w.

In all the above cases we have the absolute percentage, parts in grammes per 100 grammes, everything based on weight, even if the solvents are measured.

If the other systems of weights or measures are used, I prefer to change them to the metric equivalents, and then go back, for more accurate and scientific work is done in the metric system than any other system, as I will attempt to show later. In practice, I usually use the metric system exclusively.

PERCENTAGE CONCENTRATION. PERCENT WEIGHT TO VOLUME. % w/v.

By this method is understood to mean Gm. per 100 mils making solutions up to 100 mils.

Let us likewise consider the 5% w/v KI solution.

Proceed as follows: if water is the solvent,

take 5 Gm. of KI
add water enough to to make 100 mils.

If syrup, sp. gr. 1.313, disregard the sp. gr.,

take 5 Gm. of KI
add syrup enough to make 100 mils.

If alcohol, sp. gr. 0.816, likewise disregard the sp. gr.,

take 5 Gm. of KI
add alcohol enough to make 100 mils.

This method of making percentage solutions is preferred by physicians and pharmacists because of the teaspoonful doses, solids being weighed and liquids measured.

Unless the specific gravity of the finished product of the different percentage solutions and the solvents is known, it is impossible to base percentage concentration % w/v upon a given 100 mils of solvent and the desired substance to it.

The above three cases do not take into account the specific gravity of the solvent; only that sufficient diluent is added to the weighed substance to make it up to 100 mils.

VOLUME PERCENTAGE. PERCENT BY VOLUME. % v/v.

By this is meant mils per 100 mils of solution.

To make a 5% v/v spirit of chloroform, take 5 mils of chloroform and add 95 mils of alcohol.

To make a 10% spirit of a volatile oil, from 100 mils of solvent,

$$100\% - 10\% = 90\% = 100 \text{ mils of alcohol}$$
$$100\% = 100 \div 0.90 = 111.1$$
$$111.1 - 100 = 11.1 \text{ mils of volatile oil to be used.}$$

This method is usually used by physicians and pharmacists, when all liquids are measured, regardless of their specific gravity.

In the above discussion the mil of water is practically considered as weighing 1 Gm., and the rule mils $\times$ sp. gr. = Gm. is usually considered the best for temperatures from 15° C. to 25° C.

Again, I repeat, that where real precise and accurate work is desired use the metric system, and make percentage solutions weight to weight.

From the study of the above problems, it is apparent how complicated it must be to use other systems as the apothecary fluidounce, and avoirdupois weights, when making up percentage solutions, because of another discrepancy in the understanding as to whether 1 fluidounce of water is to be taken as weighing 456.3, 455.7, 454.6 at 4° C., 15° C., or 25° C. Practically, they say no harm is done, yet is the solution really accurate?

It has been my experience to fill prescriptions for several physicians where percentage solutions were to be based on weight, but the majority of the physicians desire the percentage solutions to be based by weight to volume for solids, and volume to volume for liquids. One physician stated than when I filled a prescription of his calling for a 4% solution of silver nitrate that each fluidounce should contain 20 grains of silver nitrate, basing his calculations on the fluidounce as equal to 500 minims.

The old adage "a pint is a pint the world around" should be forgotten. Too many pharmacists and physicians confuse ounce apothecary and fluidounce apothecary, and then complicate it still more by adding the % sign, when they desire percentage solutions.

I have had the peculiar experience of seeing a pharmacist when filling a prescription calling for 1 fluidounce of a saturated solution of potassium iodide base it on the weight of an ounce, saying one fluidounce weighs 437.5 grains, and then using the avoirdupois drachm of 27.34 grains as drachms of 60 grains.

Thus 1 part of KI is soluble in 0.7 part of water and equals 1.7 parts of solution. Then 1.7 parts = 437.5, 1 part = 1/1.7 of 437.5 = 257.4 grains. 257.4 ÷ 60 = 4.289, or 4.3 drachms. Then in filling the prescription calling for the one ounce of saturated solution of KI use 4 drachms avoirdupois and 10 grains (total 130 grains) and add water to make one fluidounce, and actually dispensing it as a saturated solution. If a pharmacist performs such a blunder as above, whether ignorantly or on purpose, it is no wonder that physicians, surgeons, dentists, and even veterinarians, desiring to get results from the medicines they prescribe, lose faith in the profession of pharmacy, and estimate it of little or no value, and really doubt our accuracy in the art of dispensing, when the same is performed by the pharmacists that do know.

Is there no remedy for this? Can not physicians, dentists, veterinarians, and pharmacists come to a better understanding and adopt a certain method of writing and filling percentage prescriptions?

As a suggestion to a possible solution of this problem, the percent absolute, % w/w, is the most accurate one, and will cover all desired cases of amounts. It is used exclusively in Continental Europe.

But in Great Britain and the United States solids are preferred to be weighed and liquids measured. Therefore, would it not be a good plan to adopt the system required and ordered in the departments of Army and Navy, Marine Hospital Service, and Public Health, that in their work to use the metric system exclusively, expressing solids in grammes and liquids in cubic centimeters. If this rule of weighing solids and measuring liquids in the metric system exclusively were adopted, then we could say that any percentage solution called for would mean % w/v in the case of solids, and % v/v in the case of liquids, the solids being weighed, the liquids being measured, and the whole made up to the desired finished volume.

And lastly, this method would easily give the dose per teaspoonful, which is really of great importance to the physician.

Thus, 120 Cc. of a 7.5% solution of ammonium chloride, NH_4Cl, in syrup would contain $120 \times 0.075 = 9.0$ Gm. of NH_4Cl, and enough syrup added to make 120 Cc. or mils. One teaspoonful = 4 Cc., then $120 \div 4 = 30$ teaspoonfuls. $9 \div 30 = 0.3$ Gm. of NH_4Cl, the dose per teaspoonful.

A CORRECTION TO BE APPLIED TO PERCENTAGE SOLUTIONS.

In the problems, the solids and the liquids were assumed to be 100% pure. If they are not the use of alligation simplifies the process. However, the problems can be solved by percentage and ratio and proportion.

If volumes contract it is preferable to weigh the substances.

Rule. Divide the amount figured on the 100% pure basis by the real percentage expressed in its decimal fraction and use this amount of substance. Then make up to the required number of Gm. or mils, as the case may be for % w/w, % w/v, or % v/v.

Or apply Alligation, Rule III (which see).

Thus, how much 95% sulphuric acid will be necessary to make 100 Gm. of 10% acid?

10% of 100 Gm. = 10 Gm.

10 Gm. $\div$ 0.95 = 10.53 Gm. of H_2SO_4

100 — 10.53 = 89.47 Gm. of water if 10% w/w,

or make up to 100 mils if 10% w/v is desired.

95 10 x or 10.52 19 : 2 : : 100 : x x = 10.52

or 10

0 85 y or 89.49 19 : 17 : : 100 : y y = 89.49

95 z 100

If a stated amount of diluent is given, proceed likewise. Thus how much liquefied phenol 87% must be added to 500 mils of water to make a 5% solution?

$500 \times 0.95 = 526.3$ mils of finished product

$526.3 \times 0.05 = 26.315$ mils of liquefied phenol

526.3 — 26.32 = 499.98 or 500 mils

87 5 x 26.3 82 : 5 : : 500 : x x = 26.3.

or 5

0 82 y 500.0

87 z 526.3

See alligation.

Under corrections to be applied to percentage solutions, mention was made of mixtures of different percentages. The six following rules of alligation will cover all such cases, whether solids or liquids, provided percentages are based on absolute percent, by weight.

Alligation is the short cut of the rule of three or ratio and proportion. In counter distinction to objections, raised, if those mixtures, solids or liquids are mixed by weight, the best and most reliable method, the allegation is very simple and exact.

ALLIGATION MEDIAL.

RULE I.—Given various amounts (two or more) of ingredients with their corresponding values; to find the value of the result when these are mixed, proceed as follows:

1. Multiply the amount of each ingredient by its value;
2. Add the values of these products;
3. Add the amounts of ingredients, or parts;
4. Divide the sum of the products by the sum of the amounts of the ingredients or the sum of the parts, as the case may be.
5. The quotient is the value of the mixture.

NOTE.—This rule is always used to prove Rules II, III, IV, V, and VI.

Example I:

Given 20 Gm. of 80%, 20 Gm. of 36%, 480 Gm. of 6% acetic acids. What will be the value of the mixture of these acids?

$$80 \times 20 = 1600$$
$$36 \times 20 = 720$$
$$6 \times 480 = 2880$$

520) 5200(10
5200

ALLIGATION ALTERNATE. USED IN ALL THE REMAINING RULES.

RULE II.—Given the values of two ingredients; to find the parts to be used of each ingredient, one of which is higher and the other of which is lower than the desired intermediate value, proceed as follows:

1. Draw a vertical line.
   (e) To the left of this line, place the value desired;
   (b) To the right of it, the values of the ingredients;
2. The value of the stronger ingredient minus the desired value equals parts to be used of the weaker ingredient.
3. The desired value minus the value of the weaker ingredient equals parts to be used of the stronger ingredient.
4. Total the parts.
5 Simplify the parts, and the total, so that the ratio and proportion can be easily applied.
6. Prove results by Rule I.

Example II:

In what proportions may 95% and 20% sulphuric acids be mixed to make 50% sulphuric acid?

	95	39	or	6	or	2	Proof	95	×	2	=	190	
50													
	20	45	or	9	or	3		20	×	3	=	60	
	75	15				5				5	)	250	(50

RULE III.—To find the amounts of stronger, weaker or total, when one of these is given, when the desired intermediate value is given, and the values of the stronger and the weaker ingredients are known, proceed as follows:

1. Apply Rule II.
2. Opposite parts, place x, y, z.

x = parts of stronger ingredient.
y = parts of weaker ingredient.
z = total parts in mixture.

3. Place the known amount opposite its proper value, and part in place of x, y, or z, as the case may be.

4. Then find the other unknowns by ratio and proportion.

5. Prove by Rule I.

Example III*a:*

Given 200 Gm. of 30% HCl. How much water must be used to make it 10%, and what is the total amount of the finished product?

	30	10	1	x	=	200
10						
	0	20	2	y		400
		30	3	z		600

Proof:	30	×	200	=	6000	
	0	×	400	=	0	
			600	)	6000	(10
					6000	

1 : 2 : : 200 : y or y = 400.

Therefore to 200 Gm. of 30% add 400 Gm. of water to make 600 Gm. 10%.

Example III*b:*

Given 500 Gm. of water. How much sulphuric acid 75% must be added to it to make 25%, and what is the weight of the finished product?

	75	25	1	x		250
25						
	0	50	2	y	=	500
		75	3	z		750

Proof:	75	×	250	=	18750	
	0	×	500	=	0	
			750	)	18750	(25
					1500	
					3750	
					3750	

2 : 1 : : 500 : x or x = 250.

Therefore, to 500 Gm. of water add 250 Gm. of 75% acid to make 10% acid, and the finished product weighs 750 Gm.

Example III*c:*

In what proportions must 28% ammonia water and water be mixed to make 560 Gm. of 10% ammonia water?

	28	10	5	x		200
10						
	0	18	9	y		360
		28	14	z	=	560

Proof:	28	×	200	=	5600	
	0	×	360	=	0	
			560	)	5600	(10
					5600	

14 : 5 : : 560 : x or x = 200.

z — x = y, or y = 360.

Therefore, 200 Gm. of ammonia water 28% and 360 Gm. of water must be mixed together to make 560 Gm. of 10% ammonia water.

RULE IV.—Given the desired total amount of ingredients and its value, and the amount of one ingredient and its value, to find the amount of the other ingredient and its value to produce the above total amount and its value, proceed as follows:

1. Multiply the desired total amount by its value;
2. Multiply the amount of the ingredient given by its value;
3. The product of the total amount by its value minus the product of the amount of the given ingredient by its value, equals the product of the amount of the other ingredient and its value.
4. The total amount minus the amount given equals the amount of other ingredient needed.

5. The product of the other ingredient and its value divided by the amount of other ingredient needed equals the needed value of the other ingredient.

6. Prove by Rule I.

Example IV:

How many grammes of belladonna and of what value, must be added to 50 Gm. of 1.2% belladonna to make 500 Gm. of 0.3% belladonna?

0.3	×	500	=	150.0
1.2	×	50	=	60.0
x	)	450	=	90.0

Proof:

1.2	×	50	=	60.0
0.2	×	450	=	90.0
		500	)	150.0 (0.3
				150.0

x = 90.0 ÷ 450 = 0.2%.

Therefore, 90 Gm. of 0.2% belladonna must be added.

RULE V.—Extension of Rule II, where there are more than two ingredients.

1. (*a*) If an even number of values, pair off the values, one higher with one lower than the desired value.

(*b*) If an odd number of values, link one value with two others, the stronger with two weaker, or one weaker with two stronger, as the case may be.

2. Place opposite each value, the difference between the value to which it is linked and the desired value, always keeping the values of the parts positive.

3. Total the parts.

4. Simplify the parts.

5. Prove by Rule I.

Example V*a*:

In what proportions may 6.5%, 5.0%, 3.0% and 2.5% cinchonas be mixed to make 3.5% cinchona?

	6.5	0.5	1
	5.0	1.0	2
3.5			
	3.0	3.0	6
	2.5	1.5	3
		6.0	12

Proof:

6.5	×	1	=	6.5	
5.0	×	2	=	10.0	
3.0	×	6	=	18.0	
2.5	×	3	=	7.5	
		12	)	42.0	(3.5

or

	6.5	1.0	2	13.0
	5.0	0.5	1	5.0
3.5				
		1.5	3	9.0
	3.0	3.0	6	15.0
	2.5	6.0	12	)42.0(3.5

Example V*b*:

How may 35, 25, 20, 10 and 5% substances be mixed to make 15%?

(I).

	35	5	1	35
	25	5	1	25
15	20	10	2	40
	10	20–10	6	60
	5	5	1	5
		55	11	)165(15

(II).

	35	5	1	35
	25	10	2	50
15	20	5	1	20
	10	20–5	5	50
	5	10	2	10
		55	11	)165(15

(III).

	35	10	2	70
	25	5	1	25
15	20	5	1	20
	10	10–5	3	30
	5	20	4	20
		55	11	)165(15

(IV).

	35	10	2	70
	25	10	2	50
15	20	5	1	20
	10	5	1	10
	5	20–10	6	30
		60	12	)180(15

(V).

	35	10	2	70
	25	5	1	25
15	20	10	2	40
	10	10	2	20
	5	20–5	5	25
		60	12)	180(15

(VI).

	35	5	1	35
	25	10	2	50
15	20	10	2	40
	10	20	4	40
	5	10–5	3	15
		60	12)	180(15

RULE VI.—Extension of Rule III to cover all cases of more than two ingredients. If known amounts of ingredients and their values are given, or a fixed amount of the desired intermediate value is sought, to find the amounts of other ingredients needed and the total amount of product produced, proceed as follows:

1. Apply Rule I for known quantitites with known values, if more than one is given, and use the result as one ingredient with a known value.
2. If the total amount desired is given apply Rule IV.
3. Apply Rule II, or Rule V, as the case may require.
4. Total the parts.
5. Simplify the parts.
6. Use x, x′, x″; y, y′, y″ and z;
   x, x′, x″, etc., representing the stronger ingredients,
   y, y′, y″, etc., representing the weaker ingredients,
   z, representing the total.
7. Substitute the known amounts opposite their proper values and parts, and solve for x, x′, etc., y, y′, etc., and z by ratio and proportion.
8. Prove result by use of Rule I.

Example VI*a:*

How much water must be added to 40 Gm. 80%, and 200 Gm. 56% acids to make an acid 20%?

80	×	40	=	3200
56	×	200	=	11200
		240	)	14400 (60

	60	20	1	x	=	240
20						
	0	40	2	y		480
		60	3	z		720

Proof: 60	×	240	=	14400
0	×	480		0
		720	)	14400 (20
				14400

Therefore 480 Gm. of water must be used.

Example VI*b:*

How much of 5% and 10% acid may be added to 420 Gm. of 50% acid to make it 25%, and what amount of product will be made?

	50	15 + 20 =	35	7	x	420
25	10		25	5	y	300
	5		25	5	y′	300
			85	17	z	1020

Proof: 50	×	420	=	21000
10	×	300	=	3000
5	×	300	=	1500
		1020	)	25500 (25
				2040
				5100
				5100

7 : 5 : : 420 : y, or y = 300.

Therefore, 300 Gm. each of 5% and 10% acid may be added to 420 Gm. of 50% acid, and the total amount of the product will be 1020 Gm. of 25% acid.

Example VI*c:*

How much 95% and 50% sulphuric acid must be added to 380 Gm. of water to make it 25%?

	95	25	5	x	100
25	50	25	5	x'	100
	0	25–70	19	y	=380
		145	29	z	580

Proof:

95	×	10	=	9500	
50	×	100	=	5000	
0	×	380	=	0	
		580	)	14500	(25
				1160	
				2900	
				2900	

19 : 5 : : 380 : x, or x = 100.

Therefore, 100 Gm. each of 95% and 50% acid may be added to 380 Gm. of water to make it 25%, and the total amount will be 580 Gm.

Example VI*d:*

How much 80%, 60% and 30% alcohol may be used to make 1000 Gm. of 50% alcohol?

	80	20	1	x'	250
50	60	20	1	x'	250
	30	10 + 30	2	y	500
		89	4	z	1000

Proof:

80	×	250	=	20000	
60	×	250	=	15000	
30	×	500	=	15000	
		1000	)	50000	(50

Therefore 250 Gm. each of 80% and 60% alcohols, and 500 Gm. of 30% may be used to make 1000 Gm. of 50% alcohol.

Example VI*e:*

Given 250 Gm. 4%; 100 Gm. 10%; 50 Gm. 16% materials; how much 9, 11, 13, 17 and 18% substances of the same kind may be used to make 1400 Gm. of 12%. Let the substance be opium.

1. Rule I.	4	×	250	=	1000		
	10	×	100	=	1000		
	16	×	50	=	800		
			400	)	2800	(7%	= value of given materials
2. Rule IV.	7	×	400	=	2800		
	?	×	1000	=	14000		
	12	×	1400	=	16800	= 14%	value to be obtained from the other

ingredients, and this must total 1000 Gm. which with the 400 Gm. of 7% will make the 1400 Gm. of 12%.

Rule V.					
		9	3	y"	150
4.		11	4	y'	200
5.	14	13	4	y	200
6.		17	5	x'	250
7.		18	3 + 1	x	200
			20	z =	1000

8. Rule I. Proof:

8	×	250	=	1000	
9	×	150	=	1350	
10	×	100	=	1000	
11	×	200	=	2200	
13	×	200	=	2600	
16	×	50	=	800	
17	×	250	=	4250	
18	×	200	=	3600	
		1400	)	16800	(12
				1400	
				2800	
				2800	

Therefore, to 250 Gm. 4%, 100 Gm. 10%, and 50 Gm. 16% opium, which in all makes 400 Gm. 7% opium, in order to make 1400 Gm. of 12% opium, there must be added 1000 Gm. of 14% opium, and this latter can be made by mixing together 150 Gm. of 9%, 200 Gm. of 11%, 200 Gm. of 13%, 250 Gm. of 17%, and 200 Gm. of 18% opium.

This last problem will be seldom met with, but really shows how such a difficulty can be solved. I have had occasion to use such problems in actual practice, in the manufacturing and dispensing of preparations.

DEPARTMENT OF PHARMACY,
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OFFICIAL NAMES FOR SYNTHETIC DRUGS.

To the Editor:

It is important that pharmacists should be familiar with the official names for synthetic drugs so far adopted by the Federal Trade Commission. These are:

Arsphenamine for salvarsan, diarsenol and arsenobenzol, etc.

Neoarsphenamine for neosalvarsan, neodiarsenol and novarsenobenzol, etc.

Barbital for veronal.

Barbital-sodium for medinal and veronal-sodium.

Procaine for novocaine.

Procaine nitrate for novocaine nitrate.

Phenylcinchoninic acid for atophan.

Under the authority of the Trading with the Enemy Act and with the advice of the Subcommittee on Synthetic Drugs of the National Research Council, the Federal Trade Commission has provided for the manufacture in this country of the important synthetic drugs which before the war were imported from abroad, chiefly from Germany.

To insure the production of the synthetic drugs urgently needed, the Federal Trade Commission had to make it worth while for manufacturers to undertake the preparation of these articles without permitting their cost to become prohibitive but rather approaching the prices current before the war. This was accomplished by granting licenses good for the life of the patents under which such drugs are made and thus making a permanent investment for their production profitable. Partly to insure for manufacturers a market for their products after the war and in large part inspired by the idea of encouraging the establishment of a permanent American industry in these important articles, the Commission wisely decided that American houses should be put on the same footing as the foreign houses for the after-the-war competition by imposing on all licenses the obligation to use new, official names for the articles, names which after the war will be open to all competitors, domestic and foreign.

Obviously if these names are once in common use the exclusive rights of the foreign houses and their agents of using after the war the old established trademarked names will not seriously handicap the American firms, and all competitors will be on the same footing, with the advantage only to those who can produce most cheaply the better article.

It is obvious that the American physician in final instance is the arbiter who can put this wise plan into operation and establish the new names firmly by prescribing these remedies by their new official names. However, *the adoption of these names by physicians will depend very largely on the pharmacist's familiarity with them.* Unless the physician is confident that the pharmacist to whom his prescription is taken is familiar with the official names, he will feel constrained to use the old, proprietary names. The pharmacist, therefore, should familiarize himself with the new, official non-proprietary names given at the beginning of this letter.

Yours truly,

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